The first collections of blooming material were made on 2nd September, 1953; for later collections of flowering material made on 8th January, 1954, I am indebted to Mr. John Meachem, Department of Forestry, Pemberton. This species was found in the karri forest (*Eucalyptus diversicolor* F.v.M.) on the sandy coastal area in south-west Western Australia, the type locality being near the roadside in a reserve of karri trees near Pemberton, Western Australia.

	No. of Carpels per Flower.	No. of Stamens per Flower (by clusters).	No. of Staminodia per Flower (by stamen clusters).
1.	2	8–13	0–0
2.	2	7–10	0–0
3.	2	6–7	0–0
4.	2	6–9	0–0
5.	2	6–11	0–0
6.	2	7–12	0–0
7.	2	6–11	0–3
8.	2	6–9	0–3
9.	3	6–7–8	0–0–0
10.	3	6–6–8	0–0–0
11.	3	8–2–7–1–9	0–0–0–0–0
12.	3	7–6–7	3–1–1
13.	3	5–9–8	0–0–2
14.	3	3–4–2	2–4–6
15.	3	5–7–8	1–1–0
16.	3	0–2–3	6–6–5
17.	3	3–2–2	5–6–6
18.	3	4–8–7	2–0–0
19.	3	6–2–7	0–5–1
20.	3	4–4–6	0–4–2

I wish to thank Mr. C. A. Gardner, Government Botanist, and Mr. R. D. Royce, Senior Botanist, for making available to me the facilities of the State Herbarium, Perth, and also Mr. J. Harding and the Dept. of Forestry, Perth, Western Australia, for their kindness in providing transportation from Perth to Pemberton.

EXPLANATION OF PLATE I.

Hibbertia serrata, sp. nov. Photograph of type specimen.
(Photograph by Woodward-Smith.)

A COMPARATIVE ACCOUNT OF THE TERRESTRIAL DIATOMS OF MACQUARIE ISLAND.

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(Plates ii-iii; twenty-three text-figures.)

[Read 28th April, 1954.]

Synopsis.

A brief account is given of the work carried out in this field by past expeditions and a systematic account has been prepared comprising the species found in samples of soil, water and fluvio-glacial sediments at Macquarie Island. The terrestrial diatoms already recorded in the antarctic and sub-antarctic have been listed for comparative purposes following the precedent of Peragallo (1921). Finally, the importance of these organisms in the soils has been discussed and consideration has been given to the influence of the past and present environment on the species occurring in the various habitats examined. Certain differences existing between the past and present diatom floras of Macquarie Island have been indicated and the reasons underlying the affinities, distribution and origin of these organisms in antarctic regions have been investigated. Diagrams and photomicrographs of every species listed from Macquarie Island have been included.

Introduction.

Far less attention has been paid to the terrestrial diatoms of the antarctic and sub-antarctic regions than to those which occur in the oceans of southern latitudes, although collections have been made since the earliest stages of antarctic exploration by scientific bodies.

Probably the first examination of terrestrial species was made by Ehrenberg (1854) from a sample of soil collected by Hooker in 1843 at Cockburn Island (64° 12′ lat. S.; 59° 41′ long. O.G.) during the voyage of the "Erebus" and "Terror" under the command of Sir J. C. Ross. Later, in 1854, Ehrenberg published the results of his examinations of samples from Kerguelen Island, Falkland Island and Cape Horn. As the result of an expedition to Kerguelen Island in 1874–5 to observe the transit of Venus, some algal material was collected by the Rev. A. E. Eaton and described by Reinsch (1876, 1879). During the voyage of H.M.S. "Challenger" (1873–6), H. N. Moseley collected further samples at Kerguelen Island and some at Marion Island, a description of the diatoms being published by O'Meara (1876). From Cape Horn, Petit (1888) described 37 species and Reinsch (1890) described 19 species from South Georgia. In 1900, Cleve published a list comprising 62 species from Magellan.

The National Antarctic Expedition (1901–4), under Scott, collected the first diatom samples from the antarctic mainland in the vicinity of Cape Adare and McMurdo Bay. The results were published by Fritsch (1912). Several forms were also gathered by Borchgrevinck about the same time and described by Holmboe (1902). Rudmose Brown returned material from the South Orkneys collected during 1902–4 and the types were described by Fritsch (1911). James Murray with Shackleton's expedition (1907–9) collected a good deal of material at Ross Island and South Victoria Land, the systematic account being prepared by W. and G. S. West (1911). Peragallo (1921) published a valuable account of the diatoms of Graham Land and included lists of species described from other antarctic localities by several authors. More than 240 species or varieties from Patagonia were described by O. Müller (1909). Fritsch (1917) described a small number of diatoms collected by the "Terra Nova" Expedition (1910) under Scott.

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The samples that have been examined in the preparation of this account were collected by the author at Macquarie Island during 1951–2 whilst he was engaged as biologist with the Australian National Antarctic Research Expedition under the leadership of Mr. P. G. Law.

It will be seen from a map of the antarctic that the present collection is important since it is representative of the only land in sub-antarctic latitudes between Kerguelen and the southern tip of South America and the closest link with Cape Adare and South Victoria Land from which other collections have been gathered.

Although it is suspected, for reasons to be given later, that the lists of species from some of the other antarctic islands are not complete, it should be possible, with the information at present available, to make certain postulations regarding the differences and affinities existing between the diatom floras of these regions. Further, with a rather detailed knowledge of the ecological environments of Macquarie Island, some account may be given of the possible factors influencing the local distribution of the various species.

Preparation of the Specimens for Examination.[1]

Subsamples of the soil, peat or mixed algal material were placed in Kjeldahl flasks and boiled in concentrated nitric acid until all the organic matter was destroyed. The flasks were then filled with triple-filtered tap water and the sediment allowed to settle. The supernatant liquid was removed by decantation and the process was repeated until the washings were no longer acid. A small quantity of the sediment was spread on a no. 0 coverslip and dried carefully before mounting in canada balsam on a microscope slide.

It is considered that, since mixed slides facilitate comparison between species and thus aid in identification, the preparation of single species mounts is of doubtful value, especially in the light of the arbitrary separation of many variable types into specific groupings.

Each slide was scanned carefully at least four times with both high power dry and oil immersion lenses. It is believed that very few, if any, species have been missed from the account which follows. The table showing the degree of abundance of the various species isolated from the soil has resulted only from estimates and is not based on strictly quantitative methods.

Notes on the Samples.

a. Soils.

1. A mineral soil from the feldmark; primitive; derived from till; pH 6·8; % organic carbon 3·6; % nitrogen (total) 0·3; C/N 12·0; soil adhering to underside of pads of the moss, *Dicranoweisia antarctica* (C.M.) Par.; 1000 feet above sea level; continually wet; soil temp. rarely higher than 4°C.

2. An organic soil from the feldmark; localized to cushions of *Azorella selago* Hook. forming incomplete cover of the surrounding till; pH 6·2; % org. C 12·5; % N (total) 0·78; C/N 16·0; 700–800 feet above sea level; continually wet; soil temp. rarely higher than 5°C.

3. An organic soil from the sub-glacial herbfield, Gadget Gully; water table constantly at or, in places, above the surface; pH 7·1; % org. C 18·5; % N (total) 1·56; C/N 12·0; 500 feet above sea level; soil temp. in Feb. 6·0°C.

4. Wet tussock grassland bordering beach, Hasselborough Bay; bare boggy ground between tussocks; frequented by seal elephants; pH 4·3; soil temp. Feb. 8·4°C. Following

[1] From continued direct observation of soil and water samples and *in vitro* studies, it is believed that most of the species described in this paper are living constituents of the flora in the environments from which they were collected. This opinion is further supported by the fact that practically no frustules of the species which abound in the plankton of the surrounding seas and which must be blown on to the island, were found in the terrestrial samples. *Fragilariopsis antarctica* Castr. is a notable exception, but this species was observed only rarely.

figures from similar soil no. 2276 from Piper (1938): % org. C 18·6; % total N 1·58; C/N 11·6.

5. Sub-glacial herbfield; peaty organic soil continually wet; pH 5·8; % org. C 24·1; % total N 2·19; C/N 11·0; 750 feet above sea level; soil temp. Feb. 5·4°C.

6. Wet tussock grassland, Buckles Bay; black beach sand in partly exposed root masses of *Poa foliosa* Hook. f.; well-drained area bordering beach; pH 4·3; % org. C 1·3; % total N 0·11; C/N 11·8; soil temp. Feb. 8·0°C.

7. Small pockets soil around roots of *Puccinellia macquariensis* Cheesm. growing on rocks jutting into sea, Buckles Bay; % org. C 4·4; % total N 0·69; C/N 6·4; pH 7·2; soil temp. Feb. 8·0°C.

8. Wet tussock grassland; deep hill peat, moist to wet; pH 4·4; % org. C 44·6; % total N 3·33; C/N 13·4; soil temp. Feb. 4·8°C; 600 feet above Half Moon Bay; *Poa foliosa* Hook. f. dominant.

9. Wet tussock grassland; wet, deep, hill peat; pH 4·0; % org. C 43·6; % total N 3·33; C/N 13·1; soil temp. Feb. 4·8°C; 100 feet above Half Moon Bay; *Poa foliosa* Hook. f.: *Stilbocarpa polaris* A. Gray co-dominants.

10. Sub-glacial herbfield; very deep waterlogged peat; pH 4·7; % org. C 32·4; % total N 1·79; C/N 22·0; soil temp. Feb. 9·0°C; 30–40 feet above sea level, Handspike Point.

b. Lakes and Ponds.

1. Small pools in sub-glacial herbfield, Half Moon Bay (coll. B. W. Taylor 31.1.51).

2. Source of small creek in feldmark; one mile west Mt. Elder, 500 feet above sea level (coll. B. W. Taylor 1951).

3. Fresh-water pool in sub-glacial herbfield, Hasselborough Bay (coll. B. W. Taylor, Sept. 1950).

4. Stagnant pool in sub-glacial herbfield, Handspike Point (April 1952).

5. Small lake on plateau, elevation 650 feet, one mile south Scoble's Lake (coll. B. W. Taylor, 6.2.51).

6. Stagnant pool, sub-glacial herbfield, Hasselborough Bay (coll. B. W. Taylor, 3.3.51).

7. Repeat of no. 6, Handspike Point (coll. B. W. Taylor, 19.3.51).

8. Stagnant pool, wet tussock grassland, north end Isthmus, (17.8.51).

9. Repeat of no. 8, (17.8.51).

10. Bottom sediment, Prion Lake, (19.1.52).

11. Shallow water, mixed algal material, Prion Lake, (21.1.52).

c. Fluvio-glacial Deposits.

1. Half-way Hill. A deposit of banded sediments regarded by Mawson (1943) as fluvio-glacial and dating from the end of the last Ice Age. Interbedded, are several layers of lignite and diatomaceous earth. Samples 9*g*, *i*, *j*, *k*, *m*, *n* represent these strata in order of increasing depth.

2. Lusitania Bay. Deposits probably representing the same period as those from Half-way Hill and about 25 feet thick (mostly gravel). Samples 12B3 and 12B4 are from the upper and lower layers of the first peaty stratum from 5 to 6 feet below the surface. Sample 12D was taken from the second peat layer several feet lower down the profile.

3. North Mountain. Fossil peat or lignite of unknown age in a deposit up to 2 feet thick and underlying the surface 2 feet of till; 800 feet above sea level. Samples 18*d*, *e*, *f*, *j* were taken at intervals of 6 inches down the profile from 24 inches to 42 inches.

4. Flat Creek alluvial or fluvio-glacial deposits. Samples 26*i*, *j*, *k*, *l* and 27 *a-d* represent peaty strata from the surface of the exposed creek bank to a depth of about 8 feet.

5. Raised coast terrace, Hasselborough Bay. Samples F1, 2, 3, 5, 6, 9, 10 were taken at 6 inch intervals through the deep peat of this recently uplifted coastal area from the surface to the point where the peat meets the old beach sediments. No diatoms were found in samples F4, 7 and 8.

Taxonomy.

As long ago as 1855, Gregory warned against the widespread practice of multiplying specific names amongst the diatoms without adequate justification. Mangin (1914) has discussed the considerable variation in form exhibited by certain types of diatoms collected in antarctic waters and has shown that the frustular structure is not necessarily constant. Similar work has been published by Wilson (1927) as a result of investigations with *Cocconeis scutellum* Eh. Mann (1937), in pointing to the arbitrary boundaries which often exist between species and even genera and the "misty condition" of the taxonomy generally, has not classified his list of antarctic diatoms into higher groups but has arranged the genera and species into alphabetical order, "irrespective of possible relationships". This method has been followed in the present paper.

An examination of the list of species will show that no attempt has been made to change established names even though they represent types with indistinct boundaries. Explanatory notes have been added in these cases and, wherever possible, probable affinities have been indicated. The object has been to encompass the aims of nomenclature review without actual name-changing which could bring about some confusion. For comparative purposes, however, many species from the antarctic appearing as *Navicula* in the literature have been given the more recent generic name *Pinnularia* Eh.

Diagrams or photomicrographs of every species listed from Macquarie Island have been included with details of size, etc., in the accompanying index to enable any errors which may have been made to be more readily detectable by future workers. The lists of synonyms which have been appended to many of the species described include the authority's name in brackets following each list. The systematic account which follows comprises all the species observed by the author in the samples examined.

List of Macquarie Island Diatoms.

Achnanthes Bory.

Achnanthes affinis Grun.—Hustedt in Rab. Kryptogamenflora, Bd. 7, Ht. 2, p. 381. Synonym: *Microneis affinis* Cleve. (Hust.)

Achnanthes Biasolettiana Grun. (Text-fig. 7).—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 379. Synonyms: *Synedra Biasolettiana* K., *Achnanthes Biasolettiana* f. *minuta* Grun., *Microneis Biasolettiana* Cleve ?, *Achnanthes Biasolettiana* var. *perminuta* V.H. (Hust.)

Distribution: Falkland Island, Cape Horn, Magellans. (Antarctic records.)

Achnanthes brevipes Ag. var. *intermedia* K. (Pl. ii, Figs. 1 and 2).—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 425; W. and G. S. West, Brit. Ant. Exped. Reps., vol. 1, pt. 7, Pl. xxvi, figs. 126–127 (1907–9). Synonyms: *Achnanthes intermedia* K., *Achnanthes subsessilis* K., *Achnanthes multiarticulata* Ag., *Achnanthes turgens* Eh., *Achnanthes carpensis* K., *Achnanthes subsessilis* var. *ovalis* Dippel, *Achnanthes loczyi* Pantocsek. (Hust.)

Distribution: Cape Adare, Ross Island, South Victoria Land, Macquarie Island (Antarctic records).

The structure of the frustules was found to be somewhat variable, the central area of the valves being either open or bearing an isolated line of punctae on only one side. Sometimes forms intermediate between these forms were observed. The valves tend to be more rhomboid than the types illustrated by Hustedt and W. and G. S. West; the indentations in the valve walls at the edge of the central area are not obvious.

Achnanthes exigua Grun.—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 386. Synonyms: *Stauroneis exilis* K., *Stauroneis quadrata* Heribaud, *Stauroneis tylophora* Reichelt, *Microneis exigua* Cleve, *Cocconeis exigua* Torka. (Hust.)

Distribution: Magellans. (Only other antarctic record.)

Achnanthes exilis K.—Hust. in Rab. Krypt., Bd. 7, Ht. 2, p. 378. Synonyms: *Achnanthes Leibleinii* Ag., *Achnanthidium subhungaricum* Gutwinsky, *Achnanthes subhungaricum* DeToni. (Hust.)

Distribution: Kerguelen. (Only other antarctic record.)